

AfricaRISING – West Africa (Mali)

Technical Report: January-December, 2012



Executive Summary

The AfricaRISING project has initiated innovative, participatory research geared towards sustainable intensification and development in the Sudan and Guinea Savanna zones of West Africa. ICRISAT coordinated the project and collaborated with CGIAR partners (ILRI, ICRAF, AVRDC), national research institutes, and local partners to implement the different activities of AfricaRISING. The first year focused on quick-win activities which were: (1) improve our understanding of crop and farm systems and households; (2) enhance farmers' access to fodder for intensified livestock production; (3) improve seed availability and increase crop diversity with modern varieties; (4) provide young mothers and other local resource persons with useable information about child nutrition and health, while improving access to diverse nutritious crops; and (5) large scale dissemination and viewing of videos on Integrated *Striga* and Soil Fertility Management (ISSFM).

Participatory planning ensured the inventory of all available technologies for the aforementioned activities and demand driven testing and dissemination of technologies (varieties, agronomy) in the intervention zones (Koutiala, Bougouni, Yanfolila districts). Various diagnostic studies (household surveys, farm typologies and focus group interviews) were carried out and farmers and farmer organisations' capacity building (training on intensification and technologies for arable crops, vegetables, trees, nutrition for young children, improved livestock practices and community level land conventions/management and ISSFM practices) were executed on demand. An innovation platform was initiated in Yanfolila, which could form the basis for further development into an R4D platform. Furthermore, farmers were exposed to new crops and trees as well as improved varieties of crops through large scale on-farm testing and the sales of small quantities of seed (mini-packs) of improved varieties of maize, pearl millet, sorghum, moringa, hibiscus, cowpea, soybean, etc., and through a large scale ISSFM media campaign through print, radio and video messages. The quick-win phase has allowed for training that has encouraged large numbers of farmers to experiment with new varieties and agronomic practices.

In the next stage of the project, we will focus more on the systems approach, ensuring that technologies are developed that are specific to a given development domain and farm or field typology. Furthermore, modelling at different scales (field, farm, landscape) will allow for developing best-fit options and prototype farms, using "what if", trade-off and risk analyses and feeding this back to the farmers for iterative, participatory development of intensification pathways.

1. Introduction

The AfricaRISING Project started in Mali in 2012, with the goal of initiating innovative, participatory research geared towards sustainable intensification and development in the Sudan and Guinea Savanna zones of West Africa. The area indicated for intervention of this project was southern Mali, more specifically the Sikasso region. ICRISAT was assigned the task of coordinating the project and to collaborate with CGIAR partners, national research institutes and local partners to implement activities of AfricaRISING (AfricaRISING Program Framework 2012). In this technical report for 2012, the procedures of project implementation and research activities are described, early results are presented and conclusions are drawn.

2. Procedures

Implementation strategy

The Mali activities kick-started with two stakeholder meetings: one in Bougouni (end of February 2012), and one in Koutiala (beginning of March 2012). These two districts were chosen because they are part of the priority target zone for the Mali FtF program; also, they are important sorghum growing areas, with good potential for intensification. ICRISAT and the CG partners based in Samanko (ILRI, ICRAF and AVRDC) all had some initial activities in at least one of the areas, on which we built further for testing and achieving adoption of sustainable and integrated intensification options.

To each of the stakeholder workshops we invited all agricultural development and research actors and stakeholders in the district, including farmer organizations and cooperatives. Each representative presented a summary of their key activities and interests. Based on the outlines of the AfricaRising Program, as developed at the inception workshop in Tamale, we had several brainstorming sessions on options for implementation of groups of activities with the potential for sustainable intensification for farmers in the target areas. In both districts, crop-livestock integration emerged as a key entry point, with a focus on options for increased fodder production. Testing diverse options for soil fertility management accessible to specific types of target farmers, was an underlying theme for both fodder production and food crop production, in both conventional and organic crop production systems. Diversifying food crop production, especially for women farmers was the second major theme identified.

In Koutiala district, the opportunity to partner with Medecins Sans Frontieres (MSF), who was implementing a program to treat malnourished children, created a chance to work in the same communes with mothers of young children on good nutrition practices. Also in Koutiala, we discovered that previous projects had created several seed production cooperatives for a range of field crops. They all expressed the need for further strengthening business planning, especially seed marketing. One of the NGO partners present at the stakeholder meeting (AMASSA), specializes in developing and supporting rural enterprise development, which allowed us to identify cooperatives and collaborate and respond to this seed production request in the same year.

Intervention sites were chosen in close collaboration with our local partners, MOBIOM, AMASSA-AfriqueVerte, AMEDD and MSF, according to their intervention zones and villages. Priority was given to villages where active and functioning farmer cooperatives and community health centers were present.

We decided to focus our research in these two target areas generally on:

- options for integration of crop-tree-livestock innovations,
- increasing crop diversity,
- increasing availability of seeds,
- large scale training for improving knowledge on nutrition for mothers of young children, and
- integrated *Striga* and soil fertility management practices.

Furthermore, several small scale research activities focused on better understanding the crop, livestock, farm, and household systems at the AfricaRISING intervention sites. We chose the following groups of activities:

1. Increase our understanding of crop and farm systems, farm households, their assets, opportunities and constraints in Koutiala and Bougouni areas (key actors: ICRISAT, ILRI, AMEDD and ICRAF);
2. Enhancing farmers' access to fodder, and possibly feed production to support opportunities for intensified livestock or milk production, and thus increased incomes and improved manure availability (Koutiala: 1 village in depth, and Bougouni) (key actors: ILRI, ICRAF, ICRISAT, MOBIOM, AMEDD);
3. Improving seed availability and increasing crop diversity with modern varieties which provide higher productivity, thus more efficient fertilizer use in order to improve food and nutrition security, in both organic and conventional crop production situations, for both men and women farmers (Koutiala and Bougouni) (key actors: MOBIOM, ICRISAT, AVRDC, ICRAF);
4. This includes the strengthening of organizational capacity: the creation of a union of seed producers for Koutiala district, including a few other communes with strong seed or tree seedling nursery cooperatives (Koutiala) (key actors: AMASSA, ICRISAT, AVRDC, ICRAF);
5. Providing young mothers and other local resource persons with useable information about child nutrition and health, while improving access to seeds of diverse crops, including vegetables (Koutiala) (key actors: AMEDD, MSF, ICRISAT, AVRDC);

6. Large scale dissemination and viewing of videos on Integrated *Striga* and Soil Fertility Management, with and without discussions (Koutiala, Bougouni) (key actors: AMEDD, MOBIOM, ICRISAT).

Consultation meetings were held at key periods among the scientists based in Samanko, with others participating by Skype. Work plan meetings with local implementing partners were held in the two districts, which were also attended by farmer representatives from interested cooperatives, health centers, and local service providers. The political situation did lead to some rescheduling and delays, but planned field activities were largely implemented in a timely manner. However, due to the security situation and restrictions on travel in November and December, several field protocols and data have been collected only recently and are therefore not analysed and incorporated into this report.

The different partner organizations have all signed partnership agreements with ICRISAT to facilitate implementation of project activities. Farmers were the main implementers, as most activities were conducted on-farm, but lists with all their names would be too long to present here. A database is available that shows different activities implemented by village, with collaborating organisations and cooperative specified. This allows for analyses of integration of activities per village, and the level of interaction with the different partner institutes.

Partner organisations and persons involved in the project in 2012 were as follows:

Association Malienne d'Eveil et de Développement Durable (AMEDD), Koutiala: Pierre Coulibaly, Deborah Sanou (Health and Nutrition), Ousmane Dembele (Integrated *Striga* control), Bougouna Sogoba (Coordination);

AMASSA, Afrique Verte, Koutiala: Yah Diakite (Enterprise development), A. Dembele (?) (Monitoring sale of seed minipacks, seed production, and farmer managed trials for variety identification);

Mouvement Biologique du Mali (MOBIOM), Bougouni: Abdoulaye Diakite (Coordination of Field activities, Facilitation of Innovation platform for livestock intensification), (Monitoring sale of seed mini-packs, seed production and farmer managed trials for soil fertility management and variety identification);

International Livestock Research Institute (ILRI, based in Dakar and Ouagadougou): Abdou Fall, Augustine Ayantunde (Coordination, design of baseline survey, design of Innovation Platform), Alpha Kergna (Consultant, implementation of baseline survey), Moussa Djire (Consultant, Implementation of study on land use rights);

Asian Vegetable Research and Development Center (AVRDC), Mali: Albert Rouamba (Seed production on station, planning baseline survey), Keriba Coulibaly (Planning, monitoring on-farm trials, contributions to nutrition related training programs), Theresa Endres (Planning of Nutrition related training programs), NN (Monitoring of farmer managed vegetable trials in Koutiala district);

International Centre for Research in Agro Forestry, Mali: Oudjouma Samake (Training for tree propagation), Joachim Binam (Implementation of Innovation platforms, study on land use rights), Antoine Kalinganire (Coordination);

International Crops Research Institute for the Semi Arid Tropics, Mali: Tom van Mourik (Integrated *Striga* and soil fertility management and large scale training through DVD distribution, video and radio campaigns), Vera Lugutuah (Nutrition training, and monitoring), Mamourou Sidibe (Planning and coordination sale of seed mini-packs, seed acquisition from other research partners in Mali, seed production on-farm and on-station, planning and evaluating farmer managed trials); Dekoro Dembele (groundnut seed production on-station, planning and evaluating farmer managed trials), Gatien Falconnier (farmer typology, assessment of fodder production potential on field scale on farm, system modelling in collaboration with Wageningen University), Bonny Ntare (groundnut breeding); Farid Waliyar (aflatoxin management); Agathe Diama (Communication), Eva Weltzien (Sorghum and pearl millet breeding, overall coordination).

As the project focused on quick-win activities, the partners took the approach to reach out to as many villages and farmers as possible in the first year, leading to activities being spread out over as much as 69 villages. To coordinate better and get an overview of the different activities of the partners, a GIS database on maps were created showing the spatial distribution of action villages for the quick-win phase (Figure 1).

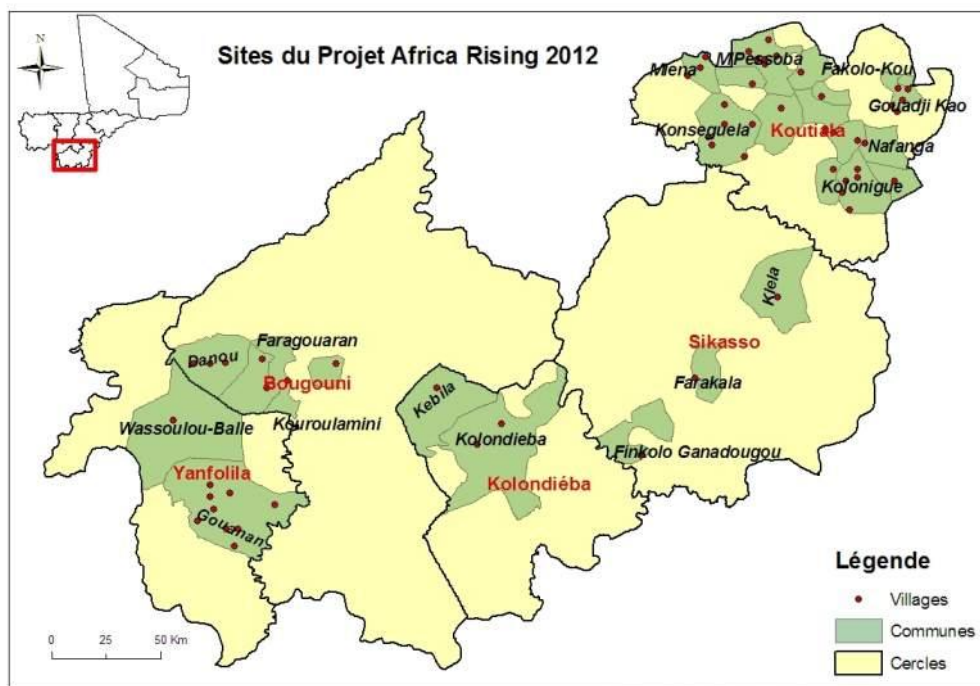


Figure 1. Sikasso region, showing the districts (in red text) and communes (black text) where AfricaRISING activities were initiated. Red dots in the map represent quick-win, action villages where at least two different types of activities were initiated.

For Activity group 1, several studies were performed, including a household survey, a survey on local land use conventions and analyses of existing, long-term household monitoring data for determining different farm household typologies in Koutiala and a biomass assessment in a village territory in Koutiala.

3. Results

Activity 1.1 Diagnostic survey of organizational and institutional issues related to land-use, management of natural resources, including forest, livestock and crop production systems

Koutiala and Bougouni are in Sikasso region, which is the major agricultural production area in Mali. Based on agricultural production statistics from 1984 to 2000, the region accounted for 37% of national millet and sorghum production, 63% of maize production, 13% of groundnut production, and 95% of cotton production (Cellule de Planification et de Statistique 2001). Koutiala is the cotton production capital of Mali followed by Bougouni. Annual precipitations in the two study sites range from 700-1000 mm and 900-1200 mm for Koutiala and Bougouni, respectively.

According to the last population census (2009/2010), the population of Koutiala is 580,453 and that of Bougouni is 458,546. The population of both study sites consists mainly of young people, based on breakdown of population of Fonfana commune in Koutiala and Garalo commune in Bougouni. Seventy-five percent of Tao rural community in Koutiala is less than 30 years old while 80% of Garalo rural community in Bougouni is less than 30 years old (Figures 2a & 2b). In both locations, the group with population of children (0-5 years old) is the biggest. The dominance of young populations in both locations is the common trend in many rural areas in Mali.

Koutiala has been experiencing emigration in the past 10 years due to declining availability of land for cropping. The inhabitants of this study site have been migrating to urban areas and to the “Office du Niger” area for seasonal farming. Bougouni is a zone that has been receiving many immigrants in the past 10 years. According to the Household Survey we conducted, 26% of the households interviewed in Bougouni were recent immigrants.

Key Issues/challenges

1. Maize and cotton are important crops in the study sites and should not be neglected in smallholder farming systems, especially as a source of household income.
2. With dominance of a youthful population in both study sites, household labor for farming is a critical issue because young people are highly mobile with a tendency to move to urban centers. However, some young people in urban centers do go back to their villages for the cropping season.
3. Child nutrition is important in both study locations in view of the significant proportion of the population that is under 5 years of age.

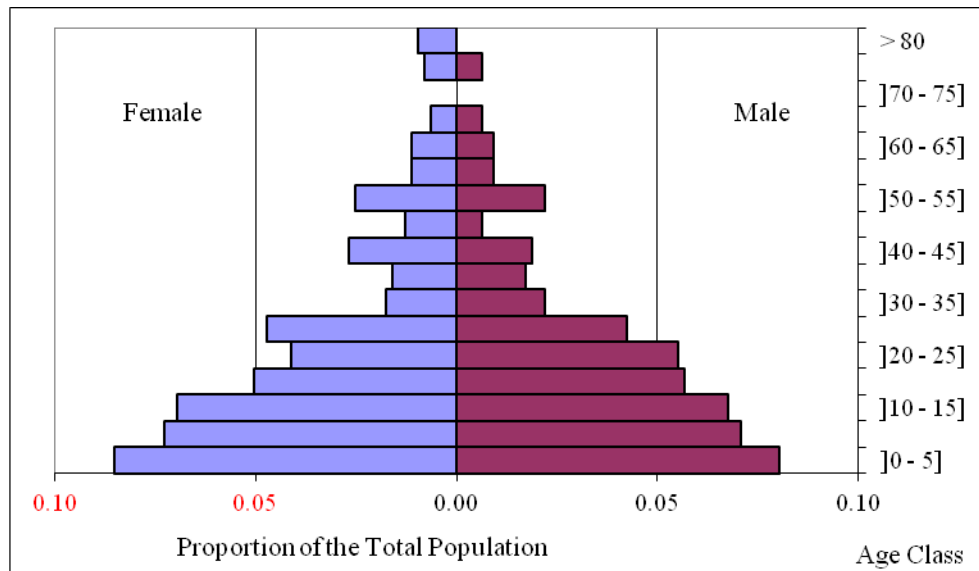


Figure 2a. Population pyramid of Fonfana “commune” in Koutiala in 2009/2010

(Source: Travail des enfants dans l’agriculture; total population 635)

I. Principal Sources of Household Income

Crops and livestock farming are the main sources of household income in Koutiala and Bougouni. From the household survey conducted, sale of crop produce accounted for about 60% of the household income in both study sites (Table 1). Principal crops grown in the study sites are cotton, maize, sorghum, millet, groundnut and cowpea. Cotton is a commercial crop whereas the cereals are important for household food security. Sale of livestock (live animals) and products accounted for about 18 and 11% of household income in Koutiala and Bougouni, respectively. Livestock is important in the farming systems in both locations, especially for farm work and transport, and as a source of manure and revenue. Off-farm activities such as small scale commerce, remittances, and salaried work accounted for about 15 and 10% of household income. Forest products contributed significantly to household income in Bougouni.

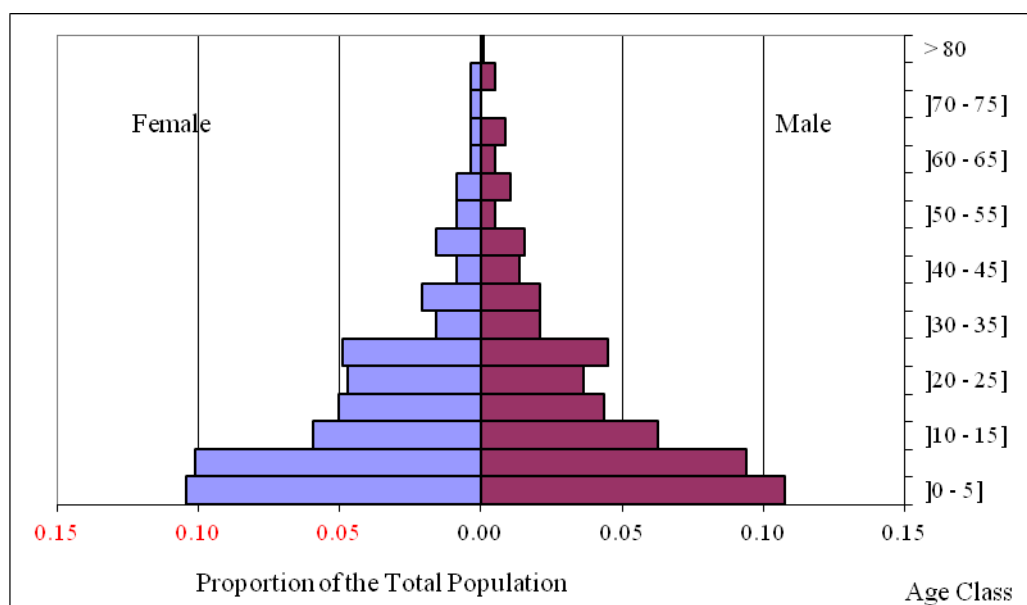


Figure 2b. Population pyramid of Garalo "commune" in Koutiala in 2009/2010

(Source: Travail des enfants dans l'agriculture; total population 575)

Table 1. Principal Sources of household income in Koutiala and Bougouni

| Income source | Koutiala (% of households interviewed) | Bougouni (% of households interviewed) |
|--|--|--|
| Sale of crop produce/products | 60 | 65 |
| Sale of live animals and products | 18 | 11 |
| Off-farm activities (small-scale commerce, remittances, salaried work) | 15 | 10 |
| Vegetable production | 5 | 2 |
| Forest products | 2 | 9 |
| Others (e.g. fishing) | 0 | 3 |

(Source: Household Survey Data 2012)

Key issues/challenges

1. Commercialization or value addition of agricultural products particularly cereals which are still mainly consumed by the household;
2. There is heavy dependence on revenue from cotton in the region and the population is vulnerable to price shocks.

II. Agricultural Tools, Implements and Inputs

Traditional agricultural tools and implements such as hoes, cutlasses, sickles, etc., are still in common use. Use of animal traction is widespread in Koutiala and Bougouni, particularly for land preparation for cotton production. According to the results of household survey, all the households interviewed in Koutiala have draught animals while 90% of the households interviewed in Bougouni have oxen. There are

a few households that reported the use of tractors in both locations, which have been loaned to the farmers by CMDT (la Compaigne Malienne de Développement des Textiles).

There is widespread use of agricultural inputs in both locations, such as inorganic fertilizers, pesticides, veterinary drugs and improved seeds (Table 2). Use of organic manure is limited as per availability. Main reasons for widespread use of agricultural inputs is the dominance of cotton production in the region; importance of livestock especially for animal traction; availability of supply by CMDT, agricultural agencies, veterinary services and extension; and long term State subsidy of agricultural inputs to boost cotton production, inorganic fertilizers, pesticides and veterinary drugs (trypanocidal drugs). From the household interviews, at least 60% of the households in both locations reported regular use of agricultural inputs.

Table 2. Use of agricultural inputs in Koutiala and Bougouni

| Agricultural input | Koutiala (% of households interviewed) | Bougouni (% of households interviewed) |
|---------------------------|---|---|
| Inorganic fertilizer | 97 | 96 |
| Pesticides | 89 | 91 |
| Veterinary drugs/medicine | 86 | 94 |
| Improved seed | 63 | 75 |

Source: Household Survey Data

Key issues/challenges

1. Low use of agricultural inputs for cereals and other crops apart from cotton.
2. Sustainability of subsidy by the State for inorganic fertilizers, pesticides and trypanocidal drugs.
3. Adequate feed for traction animals to be in good form, particularly in the early wet season when they are needed for land preparation. The animals are also often used as transport due to long distance of farms from the homestead (about 2 km in Koutiala and 4 km in Bougouni).
4. Access to credit / financial services due to distrust of financial service providers.
5. Strengthening farmers' associations and private input suppliers to reduce dominance of CMDT.
6. Quality control of veterinary drugs and pesticides to ensure proper dosage or application. There are reports of resistance to trypanocidal drugs in the region through improper dosage.

III. Crop Production and Use by Households

Crop production (total) per household varied widely for different crops for the two locations in the 2011 cropping season. The households interviewed in Koutiala and Bougouni produced more cotton and maize in 2011 than millet, sorghum and rice. Legume production (groundnut and cowpea) were generally lower than the cereals (Table 3). Cereals are critical to household food security according to the Household

Survey in Koutiala and Bougouni. At least 60% of the households interviewed reported that they used the cereal produced for household consumption (Table 4) in both locations. As expected, cotton is sold by more than 90% of the household interviewed. The use of legumes (groundnut and cowpea) is split between household consumption and sale.

Table 3. Average crop production (total in kg) per household interviewed

| Production | Koutiala (% of households interviewed) | Bougouni (% of households interviewed) |
|------------|--|--|
| Millet | 2518 | 900 |
| Sorghum | 2458 | 1238 |
| Maize | 3051 | 4710 |
| Rice | 1000 | 1620 |
| Groundnut | 1015 | 2144 |
| Cowpea | 799 | 671 |
| Cotton | 4009 | 3710 |

Source: Household Survey Data

Table 4. Use of crop produced by the households in Koutiala and Bougouni in % of total households interviewed

| Crop | Household consumption | | Sale | | Gift | |
|-----------|-----------------------|--------------|--------------|--------------|--------------|--------------|
| | Koutiala (%) | Bougouni (%) | Koutiala (%) | Bougouni (%) | Koutiala (%) | Bougouni (%) |
| Millet | 79 | 75 | 12 | 23 | 4 | 2 |
| Maize | 76 | 72 | 16 | 22 | 5 | 4 |
| Sorghum | 77 | 77 | 14 | 16 | 4 | 3 |
| Rice | 75 | 60 | 20 | 29 | 4 | 4 |
| Cotton | 9 | 0 | 91 | 100 | 0 | 0 |
| Groundnut | 49 | 41 | 40 | 52 | 2 | 3 |
| Cowpea | 84 | 55 | 16 | 40 | 2 | 2 |

Source: Household Survey Data

Key issues/Challenges

1. Value addition of crop produce, particularly cereals, and upgrading of value chains;
2. Enhancement of crop productivity to ensure household food security.

IV. Major Constraints to Crop Production

The major constraints to crop production in the study sites are insufficient agricultural inputs, unfavorable climatic condition and soil degradation (Table 5), according to the respondents. Other constraints mentioned are inadequate agricultural tools and implements, shortage of household labor, access to credit, lack of training and information, high cost of phytosanitary products, damage to crops by animals and the great distance of farms from homesteads.

Table 5. Major constraints to crop production in Koutiala and Bougouni

| Constraint | Koutiala (% of household interviewed) | Bougouni (% of household interviewed) |
|--|--|--|
| Insufficient agricultural inputs | 24 | 26 |
| Unfavorable climatic condition | 19 | 19 |
| Soil degradation/fertility problem | 18 | 8 |
| Inadequate agricultural tools and implements | 13 | 12 |
| High cost of phytosanitary products | 4 | 7 |
| Damage to crops by animals | 3 | 5 |
| Long distance of farms from homesteads | 2 | 6 |
| Household labour shortage | 5 | 3 |
| Low commodity price | 2 | 4 |
| Access to credit | 2 | 4 |
| Lack of training & information | 4 | 3 |
| Others (pest, transport, land availability) | 4 | 3 |

Source: Household Survey Data

Key issues/Challenges

1. Better access to agricultural tools, implements and inputs at affordable prices;
2. Risk mitigation strategies to cope with climate change and variability, and market shocks, particularly on cotton prices;
3. Information systems and training on improved and proven agronomic practices to enhance crop productivity.

Activity 1.2 Validation of local land use plans and supporting key interventions planned collectively

A commissioned study (ILRI with Moussa Djira) is being finalized, and will require validation with local stakeholders. It has reviewed experiences of development partners in both Bougouni and Koutiala districts with land use and NRM interventions at village, commune and landscape scales, and has conducted an evaluation of three types of local conventions: i) on natural resources management issues; ii) on the maintenance of passageways for transhumance, and local roads; and iii) on managing local fishery resources. A draft report is available, but it lacks the 'key conclusions' section.

Activity 1.3 Analyses and classification of farm household typologies and their evolution over the last 20 years in Koutiala district using long-term farm household monitoring data

In synergy with CRP1.1 activities and a McKnight-funded project, “Pathways to Agroecological Intensification of Sorghum and Millet Cropping Systems of Southern Mali”, a study and collaboration was initiated with the Institute d’Economie Rurale (IER, NARS) to share and analyse a long-term farm household monitoring dataset. Household types were determined with baseline data of 30 farms in three villages in Koutiala from 2009 using cluster analyses (Table 6). Based on the typologies classified, a decision tree was developed for classifying farm households based on a few, very basic parameters (Figure 3). Four farm household types were determined, namely (1) large, mixed crop-livestock farm with a large herd; (2) large, mixed crop-livestock farm with medium-sized herd; (3) medium-sized mixed crop-livestock farm; and (4) small farm. A simple, one-page survey form was developed, allowing for a quick assessment of household type for engaging in discussions and planning of future experiments with farmers.

Table 6. Farm household types and their assets, resulting from cluster analyses on data from 2009.

| Farm household type | Number of farms | Cropland size (ha) | Workers | Total household size | Tropical livestock units | Oxen | Draught tools |
|---|-----------------|--------------------|------------|----------------------|--------------------------|--------------|---------------|
| 1. Large mixed crop-livestock farm with large herd | 6 | 12.2 (6.2) | 21 (13) | 30 (18) | 56 (32) | 9.0 (1.3) | 6 (4) |
| 2. Large Mixed crop-livestock farm with medium-sized herd | 8 | 11.5 (7.4) | 19 (5) | 30 (5) | 11 (7) | 2.7 (1.6) | 4 (1) |
| 3. Medium-sized mixed crop-livestock farm | 11 | 6.6 (2.7) | 7 (2) | 12 (4) | 10 (7) | 2.9 (2.7) | 5 (2) |
| 4. Small farm | 5 | 3.3 (1.6) | 5 (1) | 7 (3) | 3 (2) | 1.2 (1.1) | 2 (1) |

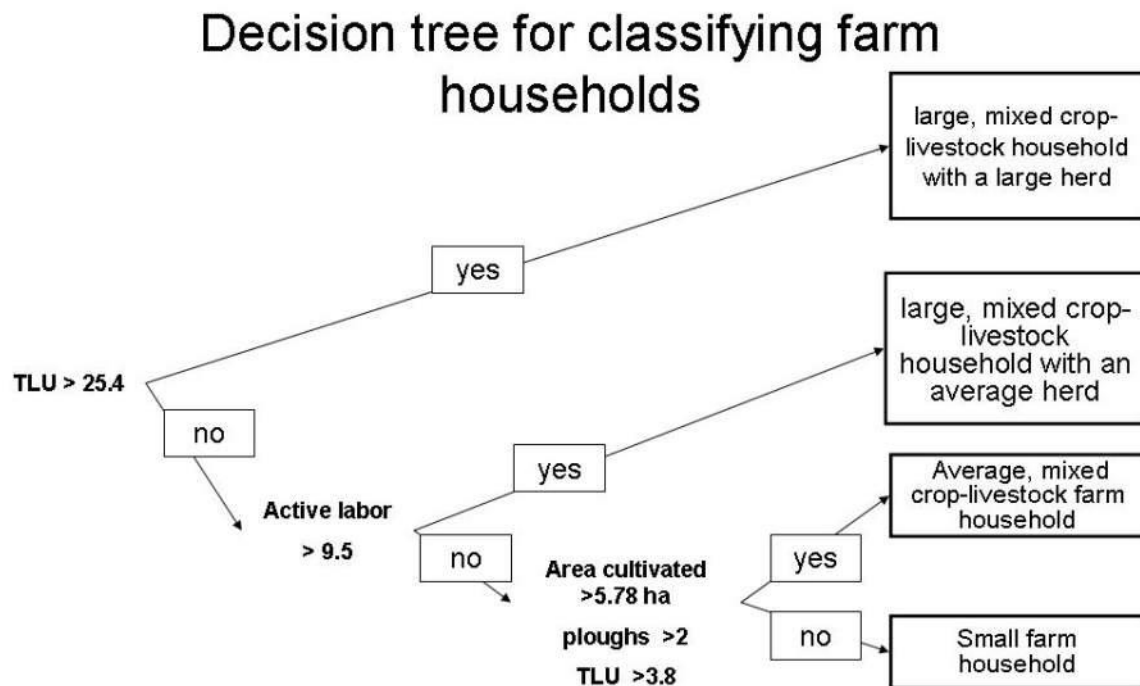


Figure 3. Decision tree for classifying farm household based on the number of tropical livestock units (TLU) owned, the number of persons constituting active labor for agriculture, the area cultivated and the number of ploughing implements owned.

Activity 1.4 Quantify total biomass at the end of the rainy season in a village territory

A team of scientists involved in both Africa Rising and CRP1.1 met in early September and discussed options for assessing total biomass production on an agro-ecological basis for a village area. The procedure involved sampling of nine, 2m x 2m quadrats, within a 30m x 30m box, laid out at 500m intervals from the village territory center outwards to the village territory boundaries on four representative transects through the village territory. In each sampling box, field biophysical characteristics and field management were determined and in each quadrant wild plant and crop species composition and biomass and soil were sampled for later determination. The protocol further envisaged the assessment of agricultural practices, tree and shrub cutting practices and the visual assessment of tree biomass encountered. A draft of the protocol has been developed and tested in the village of Oumarbougou in the Koutiala district in 2012, in collaboration with IER and AMEDD, on an exploratory basis. The biomass assessment has yield crop and wild plant species composition and biomass data for 12 sampling boxes and 108 quadrats. Of the 12 boxes 7 cropped fields were seen, holding sorghum (3), pearl millet (2), cotton (1), and aubergine (1), while the other boxes fell in non-cropped, pasture land (mainly lateritic, non-cultivable soils). Collected data is currently being entered in a comprehensive database.

Activity 1.5 Carry out participatory appraisal on production systems to document existing vegetable varieties, assess relative share of vegetables in production landscape, estimate relative prevalence and performance of vegetable intercropping options in Southern Mali

A questionnaire is being adapted from Ghana, and a team put in place. Based on the finalization of the main research hypotheses for the project, the final choice of villages using an adapted version of the IFPRI procedure, the questionnaire, and the sampling of villages will be adapted to meet the overall project needs for the period from year 2 to year 5.

Activity 2.1 Quantify biomass productivity in ongoing farmer-managed experiments, quantifying gxe interactions (soil fertility, crop density, intercropping)

In both Koutiala and Bougouni districts, some farmer groups chose to test targeted fodder production for livestock feeding. In Bougouni this involved 7 farmers (including 3 women) who are working with ILRI on a project for the conservation of the Ndama race of cattle, via intensified livestock rearing. A protocol was developed to assess fodder production in large scale production fields of 0.25 to 0.5 ha, with both cowpea, fodder type maize, and their intercrop. In Koutiala, one village will be part of a detailed study to refine models for farmer decision making, in the context of crop-livestock integration. In addition, as listed above (Activity 2.1) some farmers chose to test intercrops of maize and cowpea, for the purpose of increasing fodder availability. The crops have been harvested and data collection and entry is ongoing.

A procedure was established for harvesting stover biomass in addition to panicles, which is the routine procedure. This procedure involves harvesting all the stems of the harvested plot area, weighing them immediately after harvest, and weighing a sub-sample, which will be dried, so that the moisture content can be determined. The assessments were performed in selected villages in Koutiala district, in comparison with other sites where the same sorghum varieties are being assessed. Data collection and entry is ongoing.

Participatory trials were initiated that aimed at increasing fodder availability in maize by intercropping with dual purpose and fodder type cowpeas, using 4 different cowpea varieties (IT-90, Dunanfana, CinzanaTelimani, and the local cowpea variety) and 2 different intercropping patterns. The intercropping practices tested were an additive scheme with cowpea in between hills on every third row of maize (pattern 1) and replacement of one in three maize rows by cowpea (pattern 2). Pattern 1 (additive scheme) in combination with a fodder type cowpea showed a very interesting land equivalent ratio (LER) for fodder production, while increasing the maize grain and stover yield in comparison to a pure maize crop (Table 7).

Table 7. Selection of the maize-cowpea intercropping field trials for increased fodder production. IT90 is a grain type cowpea variety, while Dunanfana is a fodder type cowpea variety.

| | Intercropping Pattern 1 Mean Yield (kgDM.ha-1) (4 "high potential" fields) | | Intercropping Pattern 2 Mean Yield (kgDM.ha-1) (3 "high potential" fields) | |
|----------------------|--|-------------|--|-------------|
| | IT 90 | Dunanfana | IT 90 | Dunanfana |
| Cowpea Grain | 54 | 0 | 122 | 0 |
| | 65 | 0 | 56 | 0 |
| Maize Grain | 2172 | 2414 | 1491 | 1484 |
| | 717 | 1521 | 1010 | 1171 |
| Cowpea stover | 309 | 2242 | 749 | 2052 |
| | 254 | 1941 | 566 | 1419 |
| Maize stover | 2232 | 3068 | 1362 | 1291 |
| | 981 | 2272 | 1065 | 1000 |
| LER grain | 1,3 | 1,2 | 1,1 | 0,6 |
| LER stover | 1,4 | 2,1 | 1,3 | 1,3 |

Activity 2.2 Create Innovation platforms for action research on ruminant value chains/dairy and fattening

The creation of the IP platform was done in close consultation between ILRI and ICRAF with the arrival of Dr. J. Binam in the team. It covered the following phases:

1. Mobilization of IP actors;
2. Training workshop of 17 field agents and field supervisors from MOBIOM and PROGEBE on IP approach and procedures;
3. Coalition of IP partners set up on 13 and 14 September 2012:
Need assessment and priority setting (the most important constraints were lack of access to quality seed and planting material, few or nonexistent interactions with other partners along crop/livestock value chains [traders, marketers, microfinance, NGOs], limited access and low awareness of improved technological options to handle issues of crop residues-feed storage, feeding, enhancement, lack of grazing areas and non-compliance for protecting areas, etc...) and stakeholders analysis to determine IP relevant partners and their contributions in the IP was carried out.
During the workshop: a) every participant associated themselves with a specific value chain; b) working groups were established; c) every participant could express their expectations; d) roles were defined for the functioning of the platform; e) a name was elicited that makes it clear that the platform will address small ruminants and production of their feed: 'FasoJigiya'; f) the workshop prepared a general communique about the platform; g) the platform members validated the main constraints; and h) elected its officers.
4. Elaboration of the quarterly IP action plan to define key activities to be carried out prior to the official launching of the IP scheduled in the first week of December.

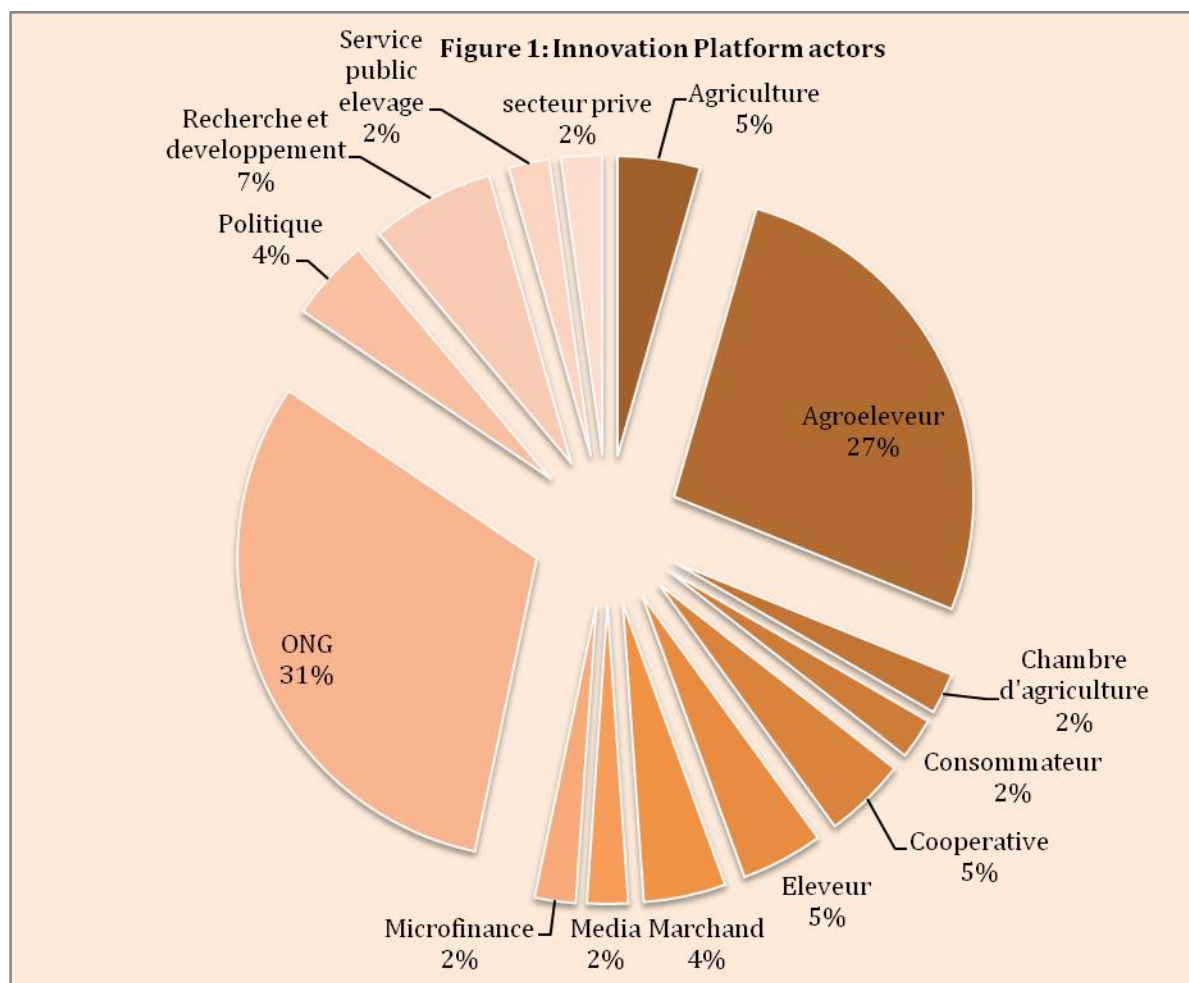


Figure 4. Composition of the actors in the Innovation Platform organised in Yorobougola, Bougouni area, Mali.

Activity 3.1 Diversify seed enterprise options for grain production, seed production or tree nursery cooperatives and their unions (cereals, legumes, vegetables, fodder crops, varieties within each species) and tree nurseries (trees, shrubs)

In Koutiala district and surrounding areas the stakeholder workshop identified several seed cooperatives that had been formed through previous projects, which had a considerable capacity for seed production, but were struggling with marketing issues. Similarly, in many of the same villages, individual and cooperative tree nurseries were identified, the members of which were keen to enhance their skills at grafting and growing a wider range of species. Based on their demands, and presentation of various options at an introductory workshop, a series of training workshops and farmer-managed trials were planned; AMASSA took up responsibility for supporting the cooperatives with enterprise skill building, including trials establishment, monitoring and evaluation for choosing new crops and varieties for production and marketing, as well as creating a farmer union for seed cooperatives for the area.

In the Bougouni district and adjacent areas, where organic cotton growers are well organized, and keen to expand crop improvement activities from cotton to a range of other crops, we decided to support this network of farmer cooperatives, again with a series of seed related activities, accompanied by soil fertility management options. Following a detailed planning workshop, a series of training programs were conducted and a range of farmer-managed trials were put in place focusing on options for fodder production, grain productivity and choice of appropriate varieties. A facilitator was recruited by MOBIOM to assist the village level cooperatives. A list of training courses is attached (Table 20). In both districts, the course topics covered seed production of chosen field and vegetable crops, implementation of farmer-managed trials, composting practices, tree nursery management, grafting local fruit tree species, farmer-managed natural regeneration, tree planting with a focus on fuel wood production, establishment of woody fodder banks, and improved poultry production. A detailed list of training workshops is attached.

Seed production activities during the off-season (groundnut, some sorghum varieties and some vegetables) supported the establishment of farmer-managed variety trials on a large scale, as well as providing seed coops with foundation seed for certified seed production (Tables 12 and 14). During the 2012 rainy season, 29.25 ha of seed production plots were established in 6 villages with 7 cooperatives in Koutiala circle, for maize, sorghum, millet, cowpea, soybean and okra. In Bougouni district, seed production focused on 3 crops – sorghum, millet and cowpea – with a total of 23 ha of seed production planted by 4 different cooperatives, involving a total of 15 women and 8 men. Data is currently being collected on yields, and monitoring and seed testing for certification of seed by the national seed authorities is ongoing.

In the Bougouni area 104 participatory trials were planned and installed while in Koutiala area, 203 trials were planned and installed by ICRISAT, AVRDC, AMASSA, AMEDD and MOBIOM along with collaborating cooperatives and farmers (Table 8). A selection of early results on sorghum, maize, soybean and groundnut trials in Koutiala district are presented, while data entry and analyses for other trials in Koutiala area and Bougouni area is ongoing. The sorghum trials and participatory evaluations showed good potential for yield increase through the use of improved varieties (e.g. DouaG, Ngolofing), but especially the hybrid “Pablo” with about 30% increase (Table 9 and Figures 5 and 6). Increased density and application of fertilizers (DAP and Urea) increased yields between 15 and 55%, depending on locality and variety. To assess whether this improved agronomic practice is also profitable or economically feasible, a participatory agro-economical analysis is planned to determine labor and input costs with farmers, calculating costs and benefits. For maize, only one hybrid (TZE-YDTSTRxTZE171) showed consistent yield superiority over the local varieties, which was not significant (Table 10). It is necessary to test a wider range of newly developed, experimental varieties and compare these to a number of well-validated improved varieties that have been adopted by the farmers (e.g. Sotubaka, Denbagnouma). Furthermore, as maize is considered to be responsive to fertilizers, it will be essential to test these varieties under promising integrated soil fertility management strategies. Several trials were installed in which 3 new varieties of soybean were tested against the locally grown variety (Table 11).

In general, there was very little difference between varieties, but one variety (TGX1908-8F) showed stable and high yields. As soybean is not promiscuously nodulating, it may be interesting to test the interaction between variety and the application of inocula with *Rhizobium* spp. and/or small doses of N and P starter fertilizers. Soybean also lends itself for intercropping with cereals such as maize and sorghum, which is also an opportunity for intensification (e.g. increase Land Equivalent Ratios).

In addition to facilitating seed production and variety trials project partners also went ahead and made mini-packs of seed available for sale. The mini-packs are designed to facilitate farmers' own experimentation, as well as remove barriers to seed trading.

In each of the zones seed packets were sold from a number of sales points. It appears from limited analysis, that the sale at the health centers was the most successful. In terms of number of packets sold, AMEDD sold about 250 mini-packs of seeds of two varieties of sorghum out of their office in Koutiala; AMASSA sold x mini-packs of seeds of sorghum (2 hybrids) out of their office in Koutiala; and MOBIOM sold 347 mini-packs of seeds of sorghum (2 hybrids, 5 improved varieties) and pearl millet (1 variety) in Koutiala; while the health centers sold over 2000 mini-packs of seeds of sorghum (3 hybrids, 3 improved varieties), pearl millet (1 improved variety), maize (2 improved varieties), cowpea (3 improved varieties), soybean, amaranth, hibiscus, baobab and moringa (Table 17).

Table 8. Number of trials by crop conducted in the two target districts, number of different villages, cooperatives, as well as number of farmers involved during the 2012 cropping season.

| Tests | No. of Villages | No. of cooperatives | No. of women (est.) | No. of men (est.) | Total No. of farmers | No. of tests |
|---|-----------------|---------------------|---------------------|-------------------|----------------------|--------------|
| Bougouni district | | | | | | |
| Cowpea variety trials (5) | 7 | 4 | 9 | 19 | 28 | 28 |
| Comparison of fodder crops (cowpea sorghum, maize, soybean) | 7 | 4 | 6 | 22 | 28 | 28 |
| Pearl millet and sorghum populations | | 7 | 1 | 19 | 20 | 20 |
| Sorghum-cowpea intercropping trials | 2 | 1 | 1 | | 7 | 7 |
| Sorghum variety trials (4-5) | 6 | 6 | | | 21 | 21 |
| Totals | 22 | 22 | 17 | 60 | 104 | 104 |
| Koutiala district | | | | | | |
| Maize variety trials (5) | 2 | 2 | | 5 | 5 | 5 |
| Maize variety trials (2) | 3 | 3 | | 14 | 14 | 14 |
| Millet variety trials (2) | 6 | 6 | | 26 | 26 | 26 |
| Sorghum variety trials (5) | 7 | 7 | 4 | 20 | 24 | 24 |

| Tests | No. of Villages | No. of cooperatives | No. of women (est.) | No. of men (est.) | Total No. of farmers | No. of tests |
|---|-----------------|---------------------|---------------------|-------------------|----------------------|--------------|
| Sorghum variety trials (5) with agronomy option (2) | 2 | 2 | | 8 | 8 | 8 |
| Cowpea variety trials (5) | 4 | 4 | 14 | | 14 | 14 |
| Soybean variety trials (4) | 6 | 6 | 9 | 8 | 17 | 17 |
| Groundnut variety trials (5) | 4 | 4 | 8 | 8 | 16 | 16 |
| Groundnut with organic fertilizer and gypsum | 2 | 2 | 2 | | 2 | 2 |
| Groundnut variety trials (5) with hibiscus intercropping option (2) | 2 | 2 | 8 | | 8 | 8 |
| Intercropping maize, sorghum, cowpea | 4 | 4 | | 12 | 12 | 12 |
| Chili pepper variety trial (2) | 2 | 2 | 6 | | 6 | 6 |
| Gombo variety trial (2) | 9 | 10 | 32 | 3 | 35 | 35 |
| Cabbage variety trial | 1 | 1 | 4 | | 4 | 4 |
| Hibiscus variety trial (2) | 4 | 4 | 9 | 3 | 12 | 12 |
| Total | 12 | 14 | 96 | 107 | 203 | 203 |
| Overall Total | 34 | 36 | 123 | 184 | 307 | 307 |

Table 9. Average grain yield of simple sorghum variety trials (4-5 varieties) conducted in 6 villages in Koutiala district. The sorghum hybrid “Pablo” had consistent superior performance than the local variety check and was preferred by farmers. In all but Nampossela the effect of sorghum variety was significant.

| Village (cooperative) | No. of trials | Varieties tested | | | | |
|------------------------|---------------|------------------|-------|------------|----------------|------------------|
| | | Local variety | DouaG | N’golofing | Pablo (hybrid) | Yamassa (hybrid) |
| Koutiala* | 6 | 1069 | 1017 | 998 | 1310 | 752 |
| Nampossela | 4 | 931 | 1154 | 1132 | 1195 | 938 |
| Gantièssso* | 5 | 1583 | 1199 | 1658 | 1659 | 1092 |
| Karangana* | 4 | 697 | | 814 | 1128 | 838 |
| N’Golonianasso* | 4 | 828 | | 766 | 1548 | 993 |
| | | | | | | |
| Average - all villages | | 1021 | 1123 | 1074 | 1368 | 923 |
| % increase over check | | - | 9.9 | 5.1 | 33.9 | -9.5 |

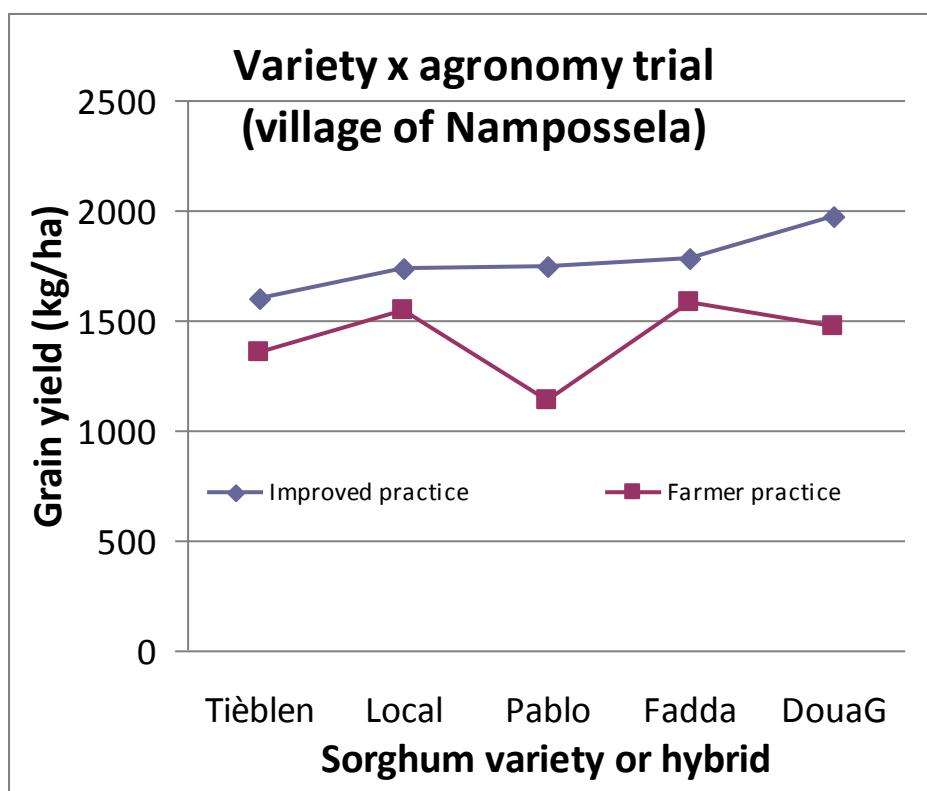


Figure 5. Yield of sorghum varieties (Local, Tieblen, DouaG) and hybrids (Pablo, Fadda) under farmer practice (no fertilizer application and sowing at moderate density of about 40cm between hills and 75cm between rows) and improved practice (application of 100kg/ha DAP and 50kg/ha Urea fertilizer and sowing at high density of 20cm between hills and 75 cm between rows) in Nampossela, Koutiala district. The effect of variety and practice was significant, but not the interaction.

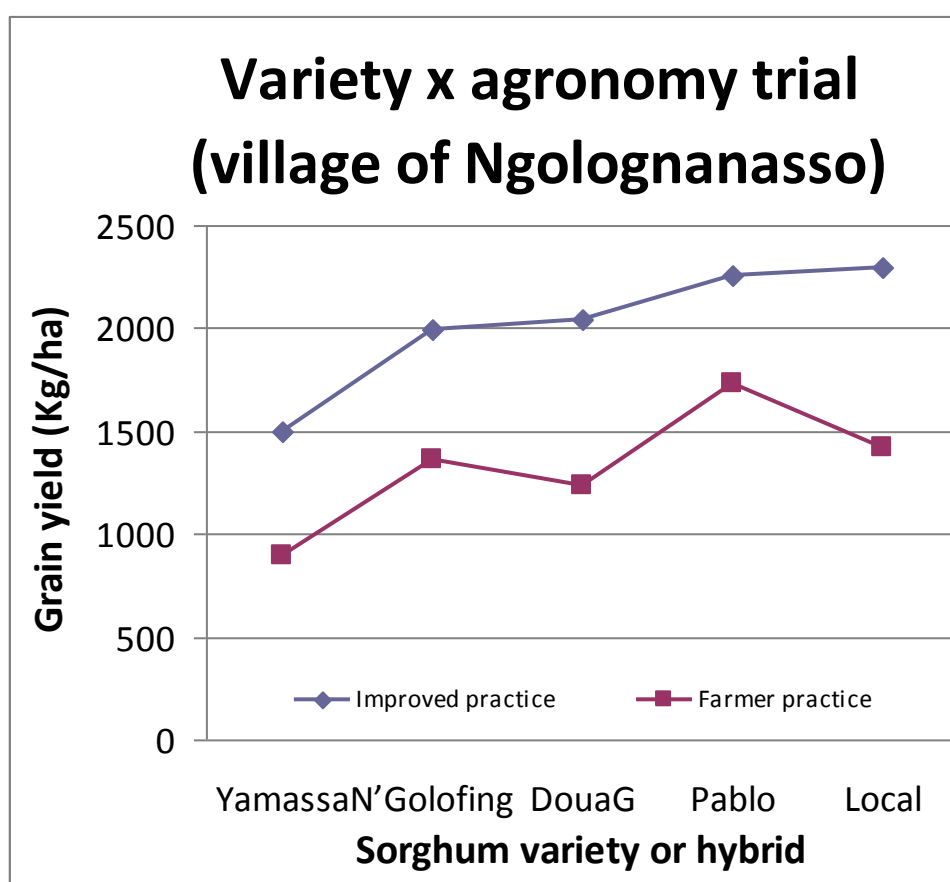


Figure 6. Yield of sorghum varieties (Local, Tieblen, DouaG) and hybrids (Pablo, Fadda) under farmer practice (no fertilizer application and sowing at moderate density of about 40cm between hills and 75cm between rows) and improved practice (application of 100kg/ha DAP and 50kg/ha Urea fertilizer and sowing at high density of 20cm between hills and 75 cm between rows) in Ngolognanasso, Koutiala district. The effect of variety, practice, and interaction between variety and practice, were significant.

Table 10. Average grain yield of simple maize variety trials (5 varieties) conducted in 2 villages in Koutiala district. The maize hybrid “TZE-YDTSTRXTZE171” had modest superior performance to the local variety check and was preferred by farmers. There was no significant effect of variety.

| Village (cooperative) | No. trials | Varieties tested | | | | |
|--------------------------|---------------|---------------------------|--------------|--------|--------|------------------|
| | | TZE- YDTSTR xTZE171 | M1124- 31 | EWB-27 | EYH-18 | Local variety |
| Nangola | 5 | 1779 | 1698 | 1673 | 1730 | 1686 |
| Koutiala | 4 | 2032 | 1817 | 1875 | 1801 | 1884 |
| Average all villages | | 1905.5 | 1757.5 | 1774 | 1765.5 | 1785 |
| % increase over check | | 6.7 | -1.5 | -0.6 | -1.1 | - |

Table 11. Average grain yield of simple soybean variety trials in Koutiala area, variety TGX1908-8F mostly outperformed (although very slightly) the local variety and was sometimes preferred. Only in Farakala was the effect of variety significant.

| Village (cooperative) | No. trials | Varieties tested | | | | |
|-----------------------|------------|------------------|------|------------|------------|----|
| | | Local variety | G196 | TGX1908-8F | TGX1935-3F | SE |
| Farakala (women)* | 4 | 1171 | 1133 | 1330 | 1237 | 5 |
| Karangana (women) | 4 | 918 | 980 | 973 | 928 | 5 |
| Sirakele (women) | 4 | 864 | 991 | 973 | 948 | 7 |
| Sougoumba (men) | 4 | 1476 | 1241 | 1305 | 1394 | 9 |
| | | | | | | |
| Average all villages | | 1107 | 1086 | 1145 | 1127 | 6 |
| % increase over check | | | -1.9 | 5.4 | -1.6 | - |

Table 12. On-station seed production of groundnut and cowpea by ICRISAT in Mali during the 2011-2012 dry season (irrigated) and 2012 rainy season.

| Groundnut seed production during off season, 2011-2012, at Samanko. | | |
|--|--------------------|-------------------|
| Variety | Pod weight (kg) | Seed weight (kg) |
| ICG 7878, ICGV 91278, ICGV 91284, ICGV 91328, ICGV 89104, ICGV 91279, ICGV 92302, ICGV 94379, ICGV 93305, ICGV 91283, ICGV 91315, ICGV 91317, ICGV 93328, ICGV 94434, ICGV 00064, ICGV 99029, ICGV 01276, ICGV 00068, ICGV 00005, ICGV 91324 | 26-857 per variety | 8-321 per variety |
| 20 varieties | 4178 | 1716 |
| Groundnut seed production during the 2012 rainy season at Samanko. | | |
| Variety | Pod weight (kg) | Seed weight (kg) |
| ICG 7878, ICGV 91284, ICGV 91278, ICGV 94379, ICGV 91317, ICGV 93305, ICGV 92302, ICGV 91324, ICGV 91328, 55-437, ICGV 93328, ICG7, JL24, J11, Fleur11, ICGV 86015, ICG 6222, ICGS11, ICGV 01276, ICGV 00064, ICGV 00068 | 28-573 per variety | - |
| 21 varieties | 2570 | - |
| Cowpea seed production during the 2011-2012 dry season and 2012 rainy season at Samanko. | | |
| Variety | Pod weight (kg) | Seed weight (kg) |
| Sankaranka, Dunanfana, IAR96, Local Maradi (Niger) | - | 40-80 per variety |
| 3 varieties | - | 200 |

Table 13. Demonstration of options for reducing aflatoxin contamination in Koutiala, Mali, 2012

| | JL24 (susceptible variety) | | |
|---|-----------------------------------|-------------------------|---------------------------|
| Treatments | Aflatoxin (ppb) | Pod yield (t/ha) | Haulm yield (t/ha) |
| Farm Yard Manure | 1.3 | 0.63 | 0.58 |
| Lime | 1.7 | 0.57 | 0.61 |
| Control | 5.2 | 0.42 | 0.37 |
| SEm (±) | 0.33 | 0.014 | 0.116 |
| CV (%) | 17.0 | 3.8 | 31.8 |
| 1. RBD design with 2 replications (2 Farmers); plot size = 100 m ² . Farmyard manure was applied at 2.5 t/ha before sowing. Lime was used at 400 kg /ha 35 days after sowing (after flowering) | | | |

Activity 3.2 Introduce, evaluate and promote high value vegetables to improve system productivity

Seed production of 7 vegetable species was initiated during the 2012 rainy season for use during dry season, as well as 2013 rainy season (Table 15). Nonetheless, seed stocks available prior to the commencement of the project were used to establish a few farmer participatory trials with ICRISAT-contracted MOBIOM and PROGEBE. The trials were under the responsibility of three cooperatives in Bougouni (36 farmers, including 15 men and 21 women) and 11 in Koutiala (46 farmers, including 23 men and 23 women).

Evaluation trials and farmer exchange field days have been organised in the Koutiala and Bougouni zones. In the Koutiala zone, crops were harvested except “roselle” whose cycle is longer. However, the trials conducted by MOBIOM in the Bougouni zone are still ongoing and the data are not yet available. Thus, agronomic performances and farmer decision data are only reported for the Koutiala zone. The results showed that Batoumabe was the most preferred variety of okra (Table 15) and Nissondia the most preferred hot pepper variety (Table 16). These 2 varieties are thus potential candidates for future integration in the production systems in southern Mali.

On November 30, 2012 an open day on AfricaRising activities occurred in the village of Sirakele, almost 15 km from Koutiala. This open day was jointly organized by ICRISAT, AVRDC, ICRAF and the partners in Koutiala, such as Afrique Verte (AMASA) and AMEDD.

A total of 129 participants including 41 men and 88 women attended the event for exchanges in the field with farmers conducting the participatory tests, the nutritionists and other end users. Women trainees in nutrition, community health centers, and traditional and communal authorities of the village of Sirakele were also present.

This event, on the one hand, aimed to raise visitors’ awareness of the link between the AfricaRising tests implemented in the field and the meals consumed by people,

and to foster internal collaboration and exchanges between producers and processors/consumers and traders on the other hand. Participants discussed the new varieties of cereals, legumes, vegetables, trees, and the best production management practices. The visit ended with a cooking demonstration on enriched porridge. Many testimonials have been received with regard to the nutritional value of the enriched porridge, thus encouraging its adoption by other women.

The good adaptation of improved vegetable varieties such as okra (Batoumabe, Sasilon) and pepper (Nisondia) in the fields has been highlighted by the farmers with great enthusiasm. Media coverage was ensured by the radio network “Yeredon” of Koutiala.

Table 14. Vegetable seed production by AVRDC in Mali

| Crops | Variety | Sowing/ Transplanting dates | Area (m ²) | Expected seed quantities (kg) | Harvested seed quantities (kg) |
|-----------------------|----------|-----------------------------------|---------------------------|----------------------------------|-----------------------------------|
| Amaranth | A2002 | 24 August/N.A. | 2205 | 50 | Ongoing |
| African eggplant | L10 | 28 June/31 July | 1598 | 30 | 22 |
| Hot pepper | Nisondia | 2 July/6 August | 1890 | 19 | 20 |
| Okra | Sasilon | 10 August/N.A. | 1890 | 94.5 | 18.3 |
| Roselle (Hibiscus) | L28 | 22 August/N.A. | 1890 | 40 | Ongoing |
| Sweet pepper | Wassa | 20 July/23 August | 338 | 1.18 | Ongoing |
| Tomato | ICRIXINA | | | 0.4 | 0.75 |
| Tomato | Xina | 21 June/17 July | 1890 | 3.78 | 4 |

Table 15. Results of the okra variety trials in Koutiala.

| Village | Okra variety | | | Number of assessors | | Farmers' preference |
|------------|--------------|---------|-------|---------------------|-------|---------------------|
| | Batoumabe | Sasilon | Local | Men | Women | |
| Koutiala | 2,875 | 1,875 | 1,562 | 45 | 15 | Batoumabe |
| Gantièssso | 3,750 | 3,125 | 1,562 | 15 | 13 | Batoumabe |
| Kintiéri | 4,250 | 2,812 | 2,187 | 19 | 13 | Batoumabe |
| Namposséla | 3,250 | 2,812 | 2,250 | 47 | 15 | Batoumabe |
| koutiala | 3,125 | 2,500 | 1,250 | 35 | 20 | Batoumabe |
| Sougoumba | 3,437 | 2,375 | 1,875 | 30 | 15 | Batoumabe |
| Karangana | 1,562 | 3,000 | 1,875 | 10 | 87 | Batoumabe |
| Farakala | 2,500 | 3,750 | 1,875 | 12 | 38 | Sasilon |
| Nangola | 2,812 | 2,187 | 2,500 | 17 | 12 | Batoumabe |
| Sirakélé | 3,437 | 2,812 | 1,875 | 5 | 87 | Batoumabe |

Table 16. Results of the chilli pepper variety trials in Koutiala.

| Village | Pepper variety | | Assessors | | Farmers' preferences |
|-----------|----------------|-------|-----------|-------|----------------------|
| | Nissondia | Local | Men | Women | |
| Kintièri | 4750 | 1875 | 40 | 15 | Nissondia |
| Karangana | 2875 | 1562 | 10 | 67 | Nissondia |

Activity 3.3 Initiate the establishment of rural resource centers, focusing on options for sustainable intensification and income generation for women, youth and other resource poor

ICRAF and ILRI have started to establish an innovation platform in Bougouni, which could evolve into such a center eventually. We are presently evaluating villages in Koutiala which are showing keen interest in a range of innovations, to discuss options for developing rural centers.

Activity 3.4 Desk review on nutritional status, quantity and quality of foods consumed, macro (energy and protein) and micronutrient intakes (vitamin A, iron, zinc and folic acid), nutrient retention during processing, infectious diseases and other factors affecting nutritional status, with the goal of producing training materials for women

Visual training material with minimum text has been developed for the sessions on nutrition and child health with women's groups at the health centers in Koutiala district on the essential nutrition and health messages, translated into the local language. In addition we have evaluated the latest research advances in terms of use and processing of undecorticated sorghum and pearl millet grains for improved bioavailability in collaboration with Wageningen University, IRD, the University of Abomey-Calavi, and the Department of Technology Alimentaire of IRSAT in Burkina Faso, via a complementary project (INSTAPA). Based on these findings we have started to work with women's groups on recipes for the preparation of porridges suitable for children.

Activity 3.5 Desk review of food safety issues including aflatoxin, water quality used during processing, pesticide residues, chemical and physical contaminants, and microbiological pathogens

Data from a two-year project on aflatoxin contamination, coordinated by IFPRI (2009-2010) will be available on the websites of ICRISAT and IFPRI. A summary of the project is being published and will be communicated to farmers in the local language and also to the government. This is linked with CRP A4NH. (Copies of these documents are available with Dr. Farid Waliyar.) An assessment of aflatoxin contamination levels was performed on groundnut samples from AfricaRISING groundnut variety trials, demonstration plots for aflatoxin control, as well as the main markets of Koutiala and Bougouni. The results indicated that several improved groundnut varieties (e.g. ICGV 91278, ICGV 91284, ICGV 94379) combine higher grain (1.2 t/ha) and haulm (4.2-5.2 t/ha) yield with reduced aflatoxin contamination levels

(2.7-4.3 ppb) in comparison to the grain (0.55 t/ha) and haulm (1.95 t/ha) yield of local varieties (aflatoxin level of 298.8 ppb).

Aflatoxin assessments on samples from markets in Koutiala showed that only 40% of the samples of groundnut grain and paste were under the international standard of a maximum of 20 ppb aflatoxin contamination. In Bougouni, aflatoxin levels in general were lower with 60% of the samples under the international standard for maximum aflatoxin contamination level of 20 ppb.

Activity 3.6 Integrate participatory breeding activities for sorghum and millet with local cattle breeder network

As the PROGEBE project did not receive their funding as expected due to the crisis in Mali, the cattle breeding network never got established. We thus started sorghum and pearl millet breeding activities with selected members of the MOBIOM network, in total with 20 farmers, who have a special interest in single plant selection, and sorghum or pearl millet varieties.

Activity 4.1 Develop and test options for introducing communication tools for preventing child malnutrition, into the community health care system

Within Koutiala zone, 6 municipalities – with 6 villages in each municipality, making a total of 36 villages – have been selected as the intervention areas in the first phase of the nutrition training activities. Selection of these 6 municipalities was based on the work of Médecins Sans Frontières (MSF) in nutrition rehabilitation in these municipalities as they have been identified as municipalities with high rates of child malnutrition. The municipalities are: Konsekoula, Medina Coura, Miena, Molobala, MPessoba, and Ntongonasso. In collaboration with two experienced community health workers from AMEDD, who also have experience with agricultural development activities, we initiated the training program, focusing on mothers of young children. The program is testing the adaptation of the cluster-based Farmer Field School approach to practical, experiential learning about child nutrition and health, by including practical sessions on food preparation, and use of a variety of crops and wild plants for enhanced nutritional quality. This training was supported by making mini-packets of seed of different species and varieties available for sale at the health centers (Table 11). Interestingly, many men used this opportunity to acquire new seeds for testing. The trainers also observed that seed of lesser known species sold more rapidly after the advantages of these species had been discussed during the training.

Table 17. Overview of the seed mini-packs provided through the 6 health centers.

| Crop | Variety | Total quantity deposited (kg) | Number of mini-packs supplied | Percentage bought (%) |
|-------------|----------------|--------------------------------------|--------------------------------------|------------------------------|
| Sorghum | Tieble | 25 | 96 | 84 |
| | Yamassa | 25 | 109 | 100 |
| | Pablo | 60 | 234 | 77 |

| Crop | Variety | Total quantity deposited (kg) | Number of mini-packs supplied | Percentage bought (%) |
|-----------------------|-------------|-------------------------------|-------------------------------|-----------------------|
| | Fadda | 50 | 211 | 67 |
| | Seguetana | 24 | 12 | 92 |
| | Tiandougou | 30 | 30 | 83 |
| Total sorghum | | 214 | 692 | 79 |
| Total millet | Similinyo | 122 | 445 | 56 |
| Maize | Denbamyuman | 140 | 328 | 33 |
| | Sotubaka | 110 | 312 | 46 |
| Total maize | | 250 | 640 | 39 |
| Cowpea | Sankaranka | 60 | 138 | 100 |
| | Yerewolo | 130 | 302 | 100 |
| | Dunanfana | 60 | 146 | 100 |
| Total cowpea | | 250 | 586 | 100 |
| Total soybean | Houla | 250 | 502 | 77 |
| Total baobab | | 5 | 30 | 43 |
| Total amaranth | | 1 | 28 | 50 |
| Total hibiscus | | 1 | 32 | 6 |
| Total moringa | | 4 | 60 | 37 |
| Grand total | | 1097 | 3015 | 69 |

Activity 5.1 Information campaign on Integrated *Striga* and Soil fertility Management, using farmer-to-farmer training video (already available), radio campaigns and other visual aids

In both Koutiala and Bougouni, training workshops were organized for field agents and lead farmers of farmer cooperatives on improved arable crop production practices and the distribution and use of visual aids for farmer training, of which the “Fighting *Striga*” DVD was the most important. A plan was made with cooperatives of AMASSA, AMEDD and MOBIOM to distribute and use the DVDs for visualization and farmer training on a large scale and to monitor the feedback on both distribution and use for training.

For an overview of videos used, please visit the website www.accessagriculture.org, where videos can be viewed and downloaded in multiple languages. Similarly, rural radios were involved in these trainings and encouraged to use the audio from the videos in their radio programs on agriculture and to distribute DVDs to visitors and listeners. Data has been collected from distribution and visualization activities of partners (NGOs, cooperatives, rural radios and individuals). A database with distribution and visualization data is available.

Table 18. Distribution of “Fighting *Striga*” DVDs to, and by, partners. Level 1 distribution is from ICRISAT to partners and Level 2 is from partners to their partners.

| Districts | Partners | Level 1 distribution | Level 2 distribution |
|----------------------------|---|---|--|
| Koutiala, Sikasso, Yorosso | AMASSA, AMEDD, MOBIOM, Radio Yeredon, Radio Yorosso | 405 DVDs 17 org. 26 pers. | 88 DVDs 36 org. 67 pers. |
| Bougouni Yanfolila | MOBIOM, Radio Arc en Ciel, Radio Kafokan | 253 DVDs 10 org. 32 pers. | 80 DVDs 36 org. 65 pers. |
| Total | 826 DVDs 99 org. 190 pers. | 658 DVDs 27 org. 58 pers. | 168 DVDs 72 org. 132 pers. |

Table 19. Number of villages where the “Fighting *Striga*” videos were visualised by partner organisations and number of persons trained, specified by gender.

| Districts | Partners | Villages | Male viewers | Female viewers | Children | Total |
|------------------------|-----------------|----------|--------------|----------------|----------|-------|
| Koutiala, Sikasso, Bla | AMASSA, | 1 | 60 | 8 | 0 | 68 |
| | AMEDD, | 17 | 1107 | 978 | 1140 | 3225 |
| | MOBIOM | 8 | 216 | 80 | 0 | 296 |
| Bougouni Yanfolila | MOBIOM, PROGEBE | 8 | 87 | 36 | 0 | 123 |
| | | 2 | 37 | 12 | 43 | 92 |
| Kita, Koulikoro | MOBIOM | 8 | 176 | 52 | 0 | 228 |
| Total | | 80 | 1683 | 1166 | 1183 | 4032 |

A total of 826 “Fighting *Striga*” DVDs were distributed to, and by, AfricaRISING partners in Mali, reaching about 99 organisations and 190 persons, as registered through feedback from distribution lists of partners. By December 2012, ICRISAT and partners had documented and reported on video visualizations in 80 villages,

reaching a total of 4032 persons, of which 29% were youth and children, 29% were women, and 42% were men. It appeared that our partners very much appreciated the training tool, and the video visualisations were enthusiastically received, while farmers expressed keen interest in experimenting with the concepts and the technologies shown in the videos. Feedback on these visualizations is presently being analysed to guide future development of farmer-to-farmer videos. It became clear that the videos sometimes create a demand for a product or technologies (seeds of varieties shown, materials shown in the videos such as triple storage bags [PICS] for cowpea storage) and that more subjects needed to be covered by the videos. (There was an overwhelming demand for a video on cowpea production practices and many requests for nutrition-related issues and preparation techniques.) A new video was produced on how agricultural extension can be more responsive to women, in collaboration with AgroInsight entitled “Women in extension”, which can be viewed here <http://www.accessagriculture.org/node/515/en> . The video was produced with inputs from ICRISAT and farmers engaged in AfricaRISING activities, so it is in part a result of this project.

Table 20. Trainings organised during the AfricaRISING quick-win period.

| Title of training program | Date(s) | Place | Total no. of participants | Women |
|---|-------------------|---------------|----------------------------------|--------------|
| Training of facilitators for installation of farmer-managed variety and agronomy trials | 9 May 2012 | Koutiala | 20 | 5 |
| Seed production, AMASSA, ICRISAT | 4-6 June 2012 | Koutiala | 42 | |
| Facilitator training on nursery management for vegetables, and variety testing | 30 June 2012 | Koutiala | 55 | 24 |
| Facilitator training on nursery management for vegetables, and variety testing | 1 July 2012 | Yoroubougoula | 48 | 23 |
| Seed production and storage for a range of crops (Sorghum, pearl millet, cowpea, maize) | 7-8 July 2012 | Koutiala | 35 | 14 |
| Integrated pest management for vegetable crops | 19-20 July 2012 | Koutiala | 50 | 29 |
| Training program - composting AMASSA, ICRISAT | 27-28 August 2012 | Koutiala | 40 | 13 |
| Training of facilitators for installation of farmer managed variety and agronomy trials | 6-7 June 2012 | Yoroubougoula | 39 | 5 |
| Sorghum seed production | 8 June 2012 | Yoroubougoula | 28 | 4 |
| Options for preparing quality compost | | Yanfolila | 37 | 10 |

| Title of training program | Date(s) | Place | Total no. of participants | Women |
|---|-----------------------|--|----------------------------------|--------------|
| Agroforestry practices | 6-8 September 2012 | Faragouaran | 27 | 3 |
| Agroforestry practices | 9 – 10 September 2012 | Kifosso | 20 | 0 |
| Agroforestry practices | 10 September 2012 | Mpessoba | 11 | 5 |
| Agroforestry practices | 11 September 2012 | Ntgonasso | 8 | 4 |
| Agroforestry practices | 12 September 2012 | Sirakele | 39 | 25 |
| Agroforestry practices | 13 September 2012 | Try | 38 | 9 |
| Installation of Innovation Platform | 27-29 September 2012 | Yoroubougoula | 45 | 5 |
| Poultry rearing | 28-29 September 2012 | Yoroubougoula | 22 | 20 |
| Training and planning meeting for Nutrition Education combined with food processing and agricultural sessions | June 2012 | Koutiala | 45 | 30 |
| Nutritional needs of children from 6-24 months of age, preparation of improved porridge using locally available ingredients | July 2012 | Mpessoba, Miena, Ntgonasso, Madiankoura (Koutiala), Molobala, Konseguela | 1224 | 1224 |
| Nutritional needs of pregnant and lactating women, preparation of groundnut sauce with green leaves, aflatoxin awareness | August 2012 | Mpessoba, Miena, Ntgonasso, Madiankoura (Koutiala), Molobala, Konseguela | 1458 | 1458 |
| Nutritional needs of sick children, preparation of porridge enriched with millet, soybean, groundnut, | September 2012 | Mpessoba, Miena, Ntgonasso, Madiankoura | As above | As above |

| Title of training program | Date(s) | Place | Total no. of participants | Women |
|----------------------------------|----------------|--|----------------------------------|--------------|
| sugar and fruit juice | | (Koutiala), Molobala, Konseguela | | |

4. Discussion

The quick-win phase and activities of the AfricaRISING project allowed ICRISAT and partners to engage with and train a very large number of farmers and mothers of young children in the Koutiala and Bougouni areas. Furthermore, a first step was made to better understand the agricultural systems, at the field, farm, and village territory level. It is clear that under the full project phase, this research component will receive a lot more attention. The AfricaRISING project coordination for Mali, in communication with the global coordination, IITA, ILRI, IFPRI, AVRDC, ACRAF and partners and the concerned USAID project, is working on a new strategy and adapting the hypotheses, approaches, indicators and workplan accordingly. The development domains and representative action and control villages have been selected and will soon be proposed to IFPRI.

5. References

Africa Research in Sustainable Intensification for the Next Generation (AfricaRISING), Program Framework 2012-2016. International Institute of Tropical Agriculture (IITA), International Food Policy Research Institute (IFPRI), International Livestock Research Institute (ILRI). 25 November, 2012. 31 pages.